Constructing the Pentagon

by Janet A. McDonnell

During the first half of 1941 as the War Department stepped up its mobilization program, it faced the increasingly acute problem of providing enough office space for its personnel. The government had taken over apartment houses, warehouses, residences, and garages to accommodate its forces. By summer 1941, the War Department numbered over 24,000 civilian and military employees housed in 17 buildings scattered throughout Washington, DC, with a total space of 2.8 million square feet. The number of employees was expected to reach 30,000 by 1 January 1942. Storage space for War Department records was also in short supply. The War Department already devoted 650,000 square feet to storage, and requests had come in for an additional 300,000 square feet. In response, the Public Works Administration proposed to erect temporary buildings to ease the office shortage. However, Brigadier General Brehon B. Somervell, Chief, Construction Division, Office of the Quartermaster General, preferred to build one building for all War Department employees.

Recognizing the severity of the problem, on 14 July 1941 President Franklin D. Roosevelt transmitted to Congress a proposed appropriation for the Public Buildings Administration, amounting to $6.5 million to be spent for the construction of temporary structures in or near Washington, DC, for the use of the War Department and other agencies engaged in the national defense effort. This proposal was referred to the Deficiency Subcommittee of the House Committee on Appropriations, which held hearings on 17 July 1941. When the estimate for temporary structures came before the subcommittee, Representative Clifton A. Woodrum of Virginia suggested that the War Department find an overall solution to its space problems. The subcommittee was not satisfied with the proposal and requested that Brigadier General Eugene Reybold, Assistant Chief of Staff of the Army G–4, investigate the feasibility of constructing a building on

land under the War Department's jurisdiction in Arlington, Virginia.

On Thursday evening, 17 July 1941, Somervell called George E. Bergstrom, a California architect and former president of the American Institute of Architects who was currently a civilian in Somervell's Construction Division, and Lieutenant Colonel Hugh J. Casey, an engineer also in that division, to his office. Somervell informed them that by 0900 Monday morning he wanted basic plans and an architectural perspective for an office building to house 40,000 persons.

Somervell originally envisioned a modern four-storied structure with no elevators (to conserve needed war materials) that would house all War Department activities. He planned to locate the huge building on the site of the old Washington-Hoover airport in Arlington County on the Virginia side of the Potomac River, however, later inspection revealed that the airport site was in the river's floodplain. On Reybold's advice, Somervell changed the proposed location to a 67-acre tract further north and west, the former Department of Agriculture experimental station, Arlington Farms, near the entrance to Arlington National Cemetery. He reduced the height to three stories so that the proposed building would harmonize with the surrounding Arlington National Cemetery and the Lincoln Memorial.

On Monday morning, as instructed, Bergstrom and Casey presented Somervell with a plan for a building with 5.1 million square feet of floor space, twice as much as the Empire State Building. Fitted to the five roads surrounding it, the building would have five sides (hence Pentagon). Somervell proposed to construct the building along with parking for 10,000 cars, roads, and landscaping for an estimated $35 million. To conserve steel for the war effort, the building would be constructed of reinforced concrete. Most of the interior office space would be open with partitions, and only top officials would have private offices.

The next day, 22 July 1941, the plans went to Secretary of War Henry L. Stimson who eventually approved them. The plans also went to the Deficiency Subcommittee of the House Committee on Appropriations, which reconvened on 22 July. General Reybold presented his arguments before the committee and then introduced General Somervell who

outlined his plan for constructing, under War Department jurisdiction, a building with a gross interior office space of roughly 5 million square feet on government land known as Arlington Farms. The cost of construction, he explained, would be roughly $7.00 per square foot or $35 million, plus another million for the parking area.

Somervell and other supporters justified the project on the basis of the need for increased efficiency. War Department employees would no longer waste valuable time traveling from one building to another to consult with each other. Efficiency would also increase because office workers would have more space. Supporters argued that the government would save $3 million annually in rent. They also argued that the new building would free up other public buildings that the War Department was currently occupying and release apartments for residential use again.

Sensitive to the severity of the space problem, Congress moved quickly on the proposal. The House Committee on Appropriations approved Somervell's proposal, as did the House Committee on Public Buildings and Grounds. On 24 July 1941, the Appropriations Committee submitted to the full House its First Supplemental National Defense Appropriation Bill for 1942 which included $35 million for the construction of a new War Department building in Arlington. A lengthy debate followed on the House floor. Opponents challenged the proposed project primarily on the basis of its tremendous size and cost. They argued that the building would consume labor and materials already in short supply, increase existing traffic problems, and be a white elephant after the war. Meanwhile, the Secretary of War, by a memorandum dated 24 July 1941, submitted the proposal to President Roosevelt for preliminary approval. FDR approved the proposal on 25 July. The House resumed debate on 28 July, approved the appropriations bill that afternoon, and sent it to the Senate.

The Senate Appropriations Committee opened its hearings on 31 July 1941. The National Capital Park and Planning Commission submitted to the committee a critical report on the proposed building. Chairman of the National Capital Park and Planning Commission Frederic A. Delano, the President's uncle, believed the project would damage the

"dignity and character" of the area around Arlington Cemetery and the Lincoln Memorial. Delano expressed his concerns to the President. In response, on 1 August, FDR sent a letter to the committee setting forth additional observations. FDR did not object to the Arlington Farms site; but he did want a smaller building, one that would accommodate only 20,000 employees, to minimize possible traffic and transportation problems.

When the Senate committee resumed its hearings on 8 August, Reybold, Somervell, and others testified in favor of the appropriation. Protests came from the DC Chapter of the American Institute of Architects, the National Association of Building Owners and Managers, and others. The Washington Commission on Fine Arts also opposed the project, arguing that the proposed location should remain open either as a park or an addition to Arlington National Cemetery. Gilmore D. Clarke, chairman of the Commission on Fine Arts, testified against the project observing that it would obscure the approach to Arlington National Cemetery and suggested that it be moved three quarters of a mile to the south to the site of the Quartermaster Depot which was under construction. The National Capital Park and Planning Commission representatives called for a smaller building.

The Senate committee reviewed alternate sites including a site three quarters of a mile southeast of the disputed Arlington Farms site, which would take care of the aesthetic objection. The War Department already owned this land and had designated it for a Quartermaster Depot. Somervell staunchly defended the original Arlington Farms site and argued that a change of location would mean scrapping plans already drawn, cause a month's delay, and add substantially to the building cost.

The Senate Appropriation Committee overwhelmingly endorsed the Arlington Farms site and reported the bill favorably without changing the language of the House bill. The Senate approved the bill on 14 August. The issue was not resolved, however, for the bill as passed failed to specify the size or design of the building. A few days later, FDR expressed concern that the proposed site would mar the beauty of Arlington Cemetery. Despite this concern, on 25 August he signed the appropriations bill that contained

the provision for the controversial War Department building but reserved the right to select a different location.

On 26 August, FDR met with General Somervell, George Bergstrom, Harold Smith, the director of the Bureau of the Budget, and the chairman of the National Capital Park and Planning Commission. He told them that he favored a smaller building on the Quartermaster Depot site and asked them to come to an agreement on this. At a press conference that day, he announced that the building would be located at the Quartermaster Depot site and should be half as large as originally planned. Two days later, in response, the Secretary of War, the chairman of the National Capital Park and Planning Commission, and the director of the Bureau of the Budget presented a joint memorandum to the President agreeing on major details of a building for 20,000 employees at the Quartermaster Depot site. The President approved this memorandum, and the depot was transferred to Cameron, Virginia. Somervell proceeded with the building at the new location with its original five-sided design, but he did not reduce the size.

Plans for the new War Department building proceeded rapidly. Bergstrom, assisted by architect David J. Witmer of Los Angeles, developed plans for a unique reinforced concrete building which would consist of five concentric pentagons, separated by light wells and connected by ten radiating spokelike corridors, two on each side. It would have five stories, occupy 34 acres, and include a 6-acre interior court, numerous ramps and escalators, a large shopping concourse on the first floor, cab stands and bus lanes, and parking for 8,000 cars. Somervell named Captain Clarence Renshaw as the project officer to direct the construction work. Renshaw had served as assistant constructing quartermaster in charge of building approaches to the Tomb of the Unknown Soldier and restoring the Robert E. Lee mansion.

Construction began on 11 September 1941 when the construction contract was awarded to a joint structure composed of three companies: John McShain, Inc. of Philadelphia; Doyle and Russell of Richmond; and Wise Contracting Company of Richmond. The contract was a cost-plus-fixed-fee contract with an estimated cost of over $31 million. With proposed floor space of 4 million square feet, it would be the

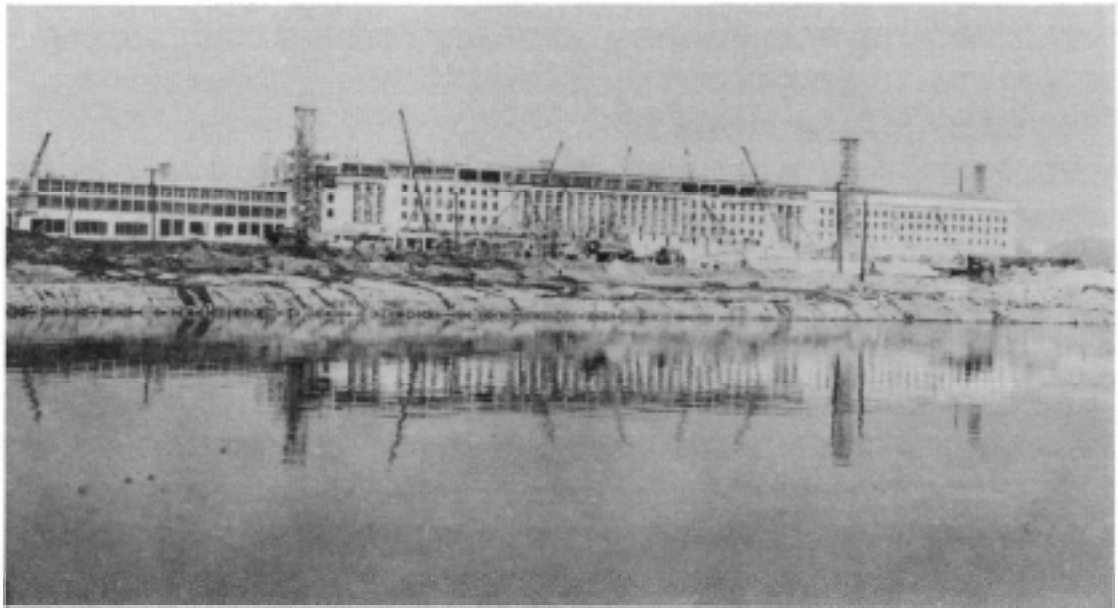
largest office building in the world. On 10 October, after construction had been underway for a month, Somervell presented the plans to FDR. Confronted with an accomplished fact, a month of construction underway and 1,000 men already at work, FDR gave his approval with one stipulation -that no marble be used-to minimize the cost.

The outbreak of hostilities on 7 December 1941 quickly changed the projected plans for completing the building. It became clear that the size would have to meet war needs. As predicted, the change in location added to the cost as did the requirement that the building be constructed for possible future use for records storage. Also, officials had decided to build more extensive water supply and sewage treatment facilities than required in order to provide such facilities for other federal buildings in the area, which also added to the cost. Somervell went back to the appropriations committees for additional funding.

The Pentagon went up rapidly during the winter of 1941-42. Architects for the project had little or no lead time. Bergstrom and Witmer were under intense pressure to deliver drawings, and sometimes construction actually outpaced planning. The contractors had three shifts working around the clock, and by December, 4,000 men were at work.

Work proceeded at a "record-breaking pace." Sand and gravel came from the Potomac River bottom. Early dredging

Northwest exposure of the Pentagon construction, 1 July1942.



Construction of the river entrance to the Pentagon, 1942.

of what would be a scenic lagoon enabled barges to bring these materials directly to the site. A plant with a daily capacity of 3,000 cubic yards fed materials into batch trucks for mixing en route to points throughout the structure. Forms for concrete columns, walls, and floors were preassembled, marked, and reused. Forms for concrete facing on the interior courts were built in place, and to save time new ones were provided for each section and old ones were taken down and salvaged.

During the early months of the war, Major Renshaw, McShain, and Bergstrom faced several crises: failure by the rolling mills to deliver steel on time, a strike by plumbers and iron workers, and last minute decisions to increase the size of the building. Construction was also plagued by an unusually high accident rate. Yet they managed to keep the job on schedule. One side was completed by 29 April 1942 when the first occupants moved in. The basic shell and roof were finished within one year and the building was completed by 15 January 1943. As occupancy increased, pressure on space in Washington, DC, relaxed.

Wartime shortages forced some modifications. Officials avoided the use of critical materials whenever possible. Bergstrom's design for a concrete structural framework resulted in a savings of 43,000 tons of steel. Concrete ramps were substituted for passenger elevators. Drainage pipes were

Pentagon construction, northeast exposure shows part of the south parking and access roads, 30 November 1942.

made of concrete. Ducts were produced from asbestos fibers; interior doors were made of wood. Bronze doors, copper ornaments, and metal toilet partitions were eliminated.

The Pentagon was the largest office building in the country at the time. It was at least two times the size of the Empire State Building and 50 percent larger than Chicago's Merchandise Mart. The National Capitol would fit into any one of its five pie-shaped sections. The design and construction of the building took only 16 months, although construction of such a structure would normally have taken four years. At its peak, the Pentagon housed nearly 33,000 workers (the average working population of a city of 100,000). Supporters predicted that the Pentagon would pay for itself in 8 to 14 years, based on a rental of the equivalent amount of office space in Washington, DC.

The frame was steel-reinforced concrete designed for floor loading of 150 pounds per square foot to meet the President's order that the building be suitable for records storage after the war. All outside exposed walls were monolithic architectural concrete, except the mile-around perimeter wall, which was faced with Indiana limestone. The building rested on 42,000 Raymond type (poured in place) concrete piles. Over 5.5 million cubic yards of earth were moved in grading. There was no unnecessary ornamentation, no fountains, no "marble

halls," and except for some 6-inch marble base and 10 pieces of marble stringer facing, no marble was used in the building at all.

Planners reduced landscaping to a bare minimum. It was confined to grading and planting of small trees, shrubs, and grass. Grading was the minimum required for safe road shoulders and the planting was the minimum required to prevent erosion and protect structures. The lagoon in front was not developed for landscaping purposes but resulted from the excavation of large quantities of material required for road and parking area fill.

Usable office floor area, not including such things as permanent corridors, ramps, concourse, stairways, bus terminal, cafeterias, and rest rooms, was 3,634,490 square feet or 58.3 percent of the gross 6,231,000 square feet, which compared favorably to other federal office buildings. There were 17.5 miles of corridors. The maximum walking distance from any point in the building to any other point was 1,800 feet (slightly more than ⅓ mile, roughly a 6-minute walk). In a conventional rectangular building of the same number of stories and equivalent floor space, the distance would be 30–50 percent greater.

Total costs amounted to $63,454,583, which included $49,957,653 for the main building and $13,496,930 for outside utilities (the power and heating plant housed in a separate building, access roads and parking lots, drainage and fills). The costs per square foot of floor area compared favorably with the corresponding figures for other federal office buildings. The gross cost per square foot of floor area was $7.86 as compared to Interior Department ($9.57) and Labor Department ($9.13). The net cost per square foot of office space amounted to $13.15.

The architects and engineer officers who designed and constructed the Pentagon produced one of the most innovative and unique structures of the war era. With this massive yet efficient structure, they not only resolved the problem of housing thousands of War Department employees during the war years; they also provided for future War Department needs.

Sources for Further Reading

The number of secondary sources dealing with the construction of the Pentagon is surprisingly small. The author of this essay drew primarily on Lenore Fine and Jesse A. Remington, *United States Army in World War II. The Technical Services. The Corps of Engineers: Construction in the United States* (Washington, DC: Office of the Chief of Military History, U.S. Army, 1972); William J. Webb, "Building the Pentagon in Arlington," *The Arlington Historical Magazine* (Volume 7, Number 4, October. 1984), pp 31–38; and Major Robert B. McBane, "The Pentagon Makes Sense" (reprint from *Army Information Digest*) in the U.S. Army Corps of Engineers History Office research collections, Military Files, General, I–8–3.

Also useful were "Basic Data on the Pentagon Building," and "The Pentagon Project." Control Division, Army Service Forces, 25 June 1944, both on file in the History Office research collections.